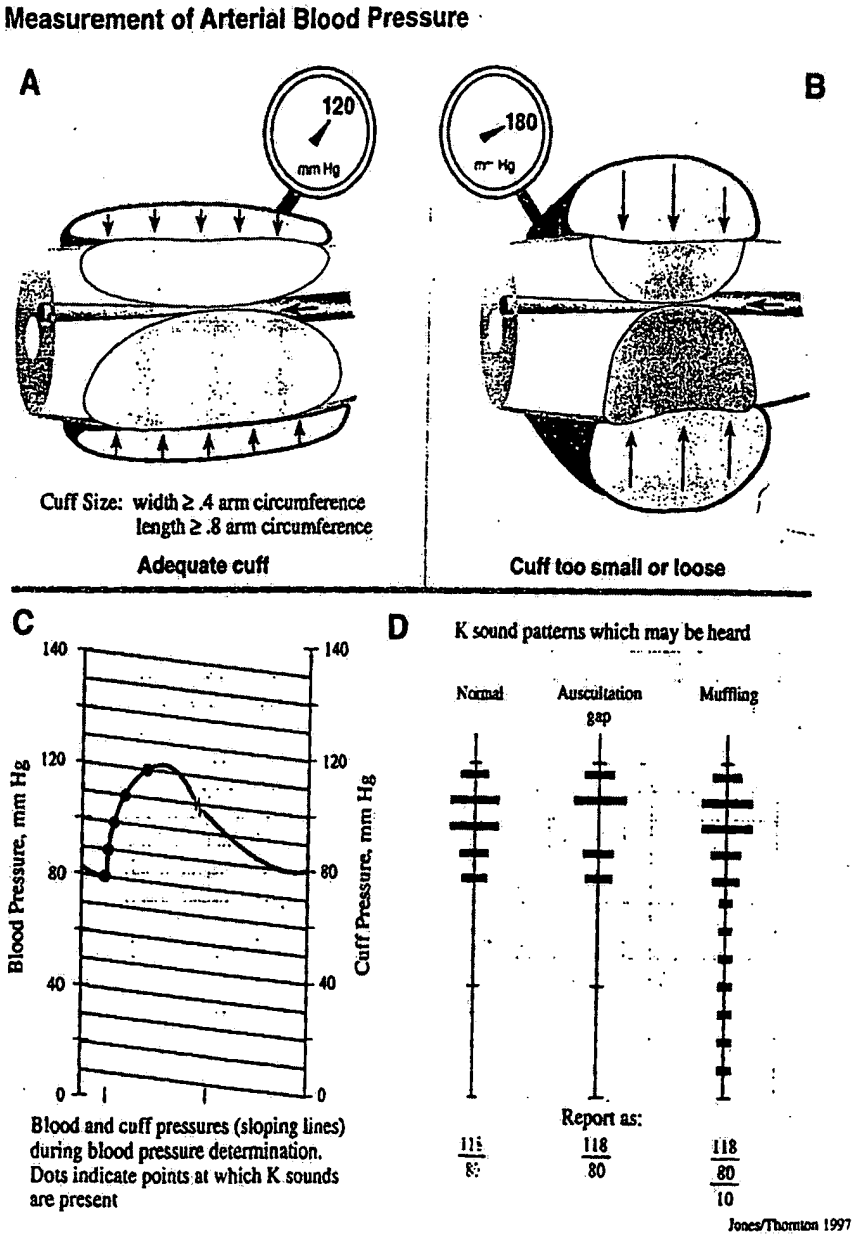


FIG. 1
PRIOR ART

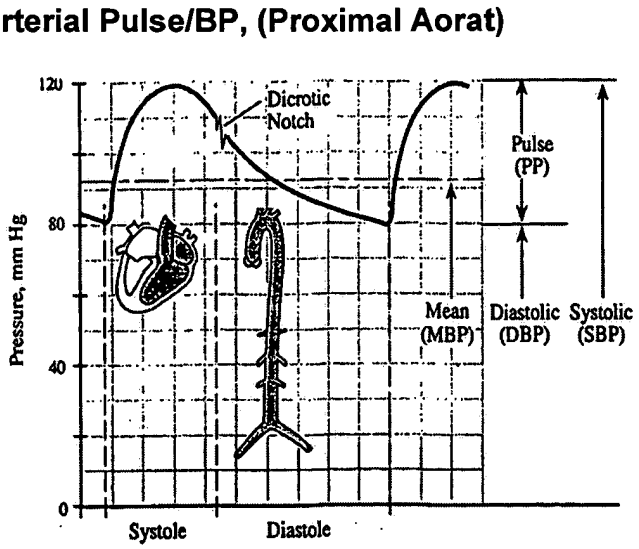


FIG. 2 - PRIOR ART

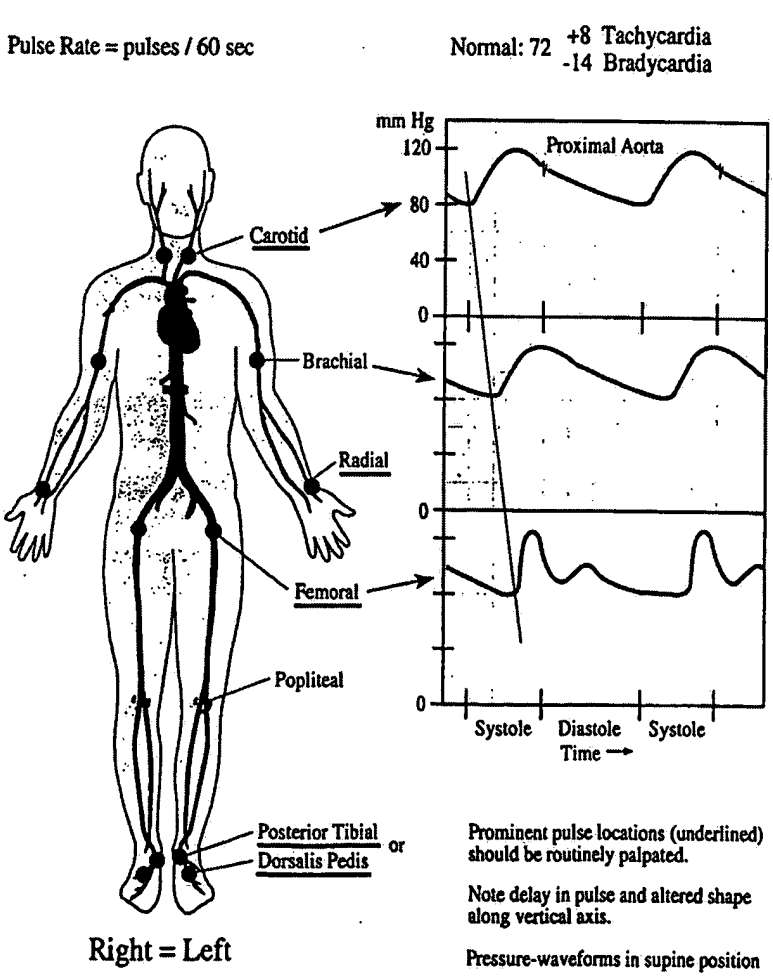


FIG. 3 - PRIOR ART

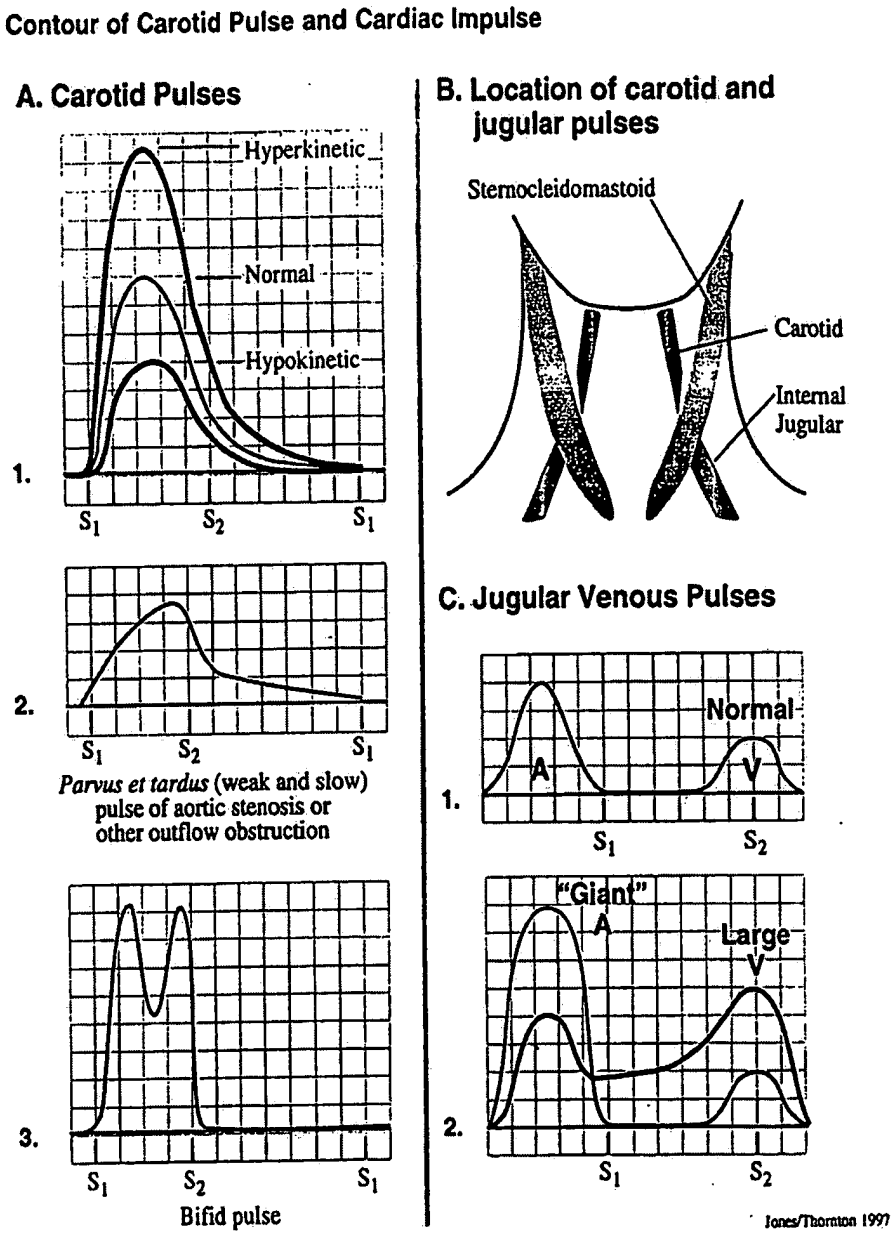


FIG. 4
PRIOR ART

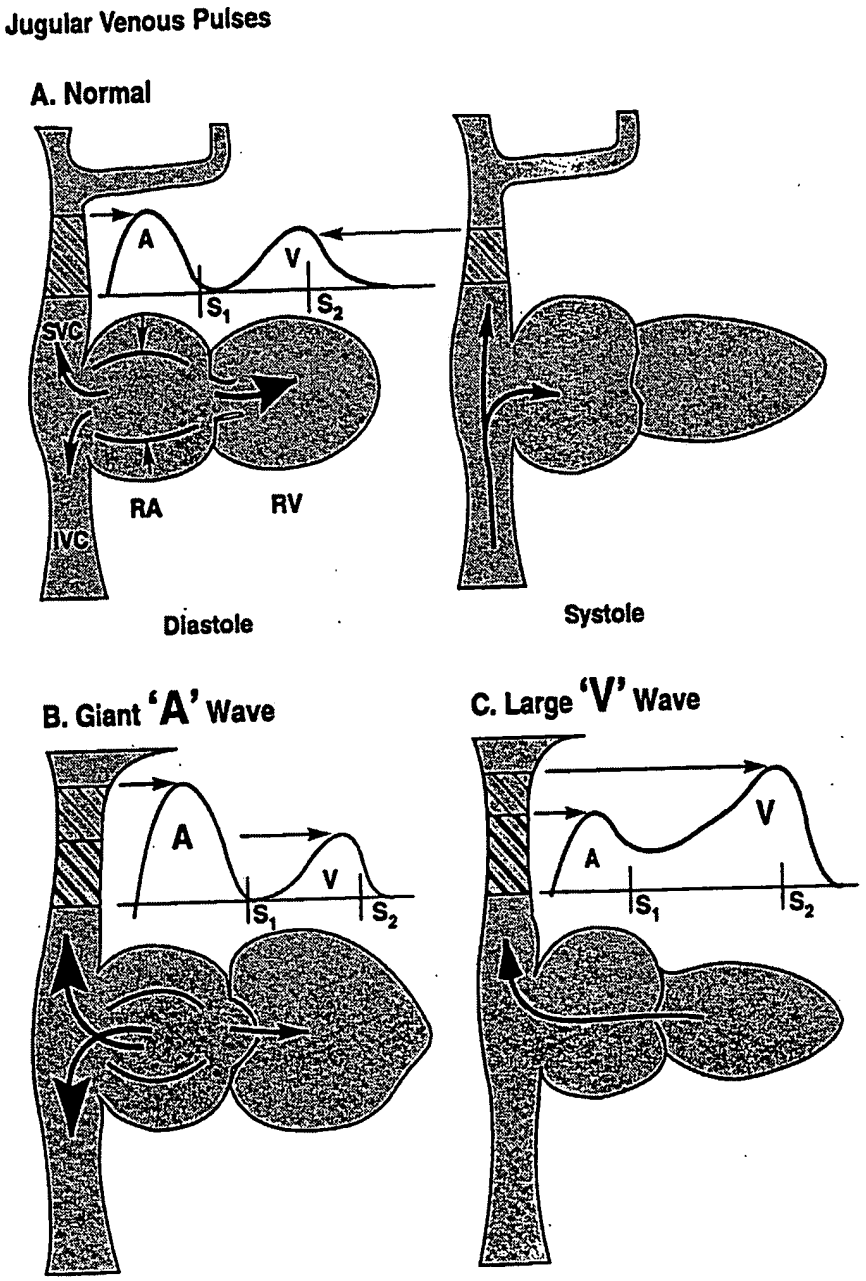


FIG. 5
PRIOR ART

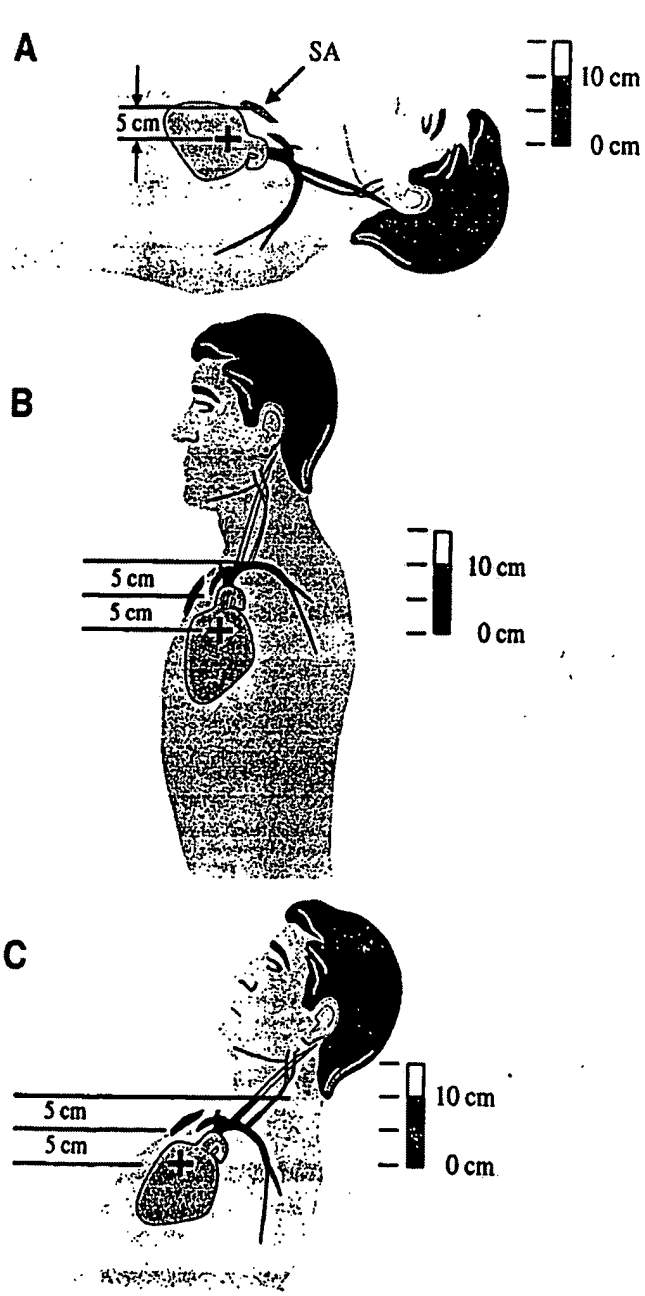
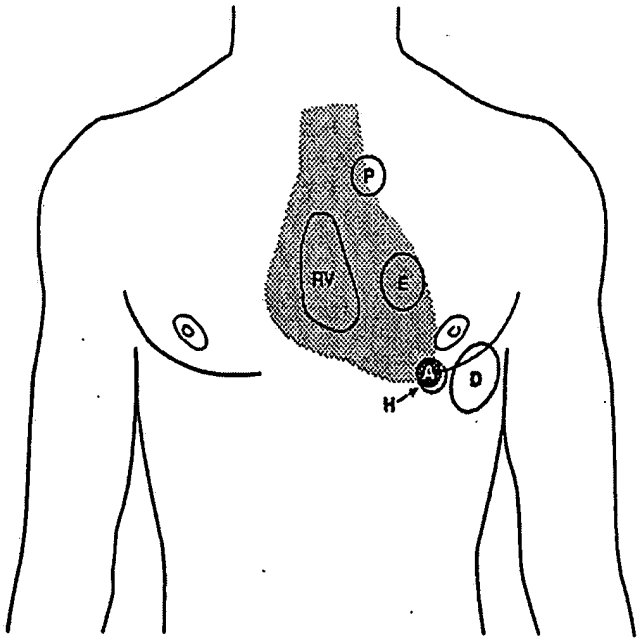


FIG. 6
PRIOR ART

Principal Areas of Cardiac Impulses



- (A) Normal left ventricular apical area, "dime sized," 5LICS–MCL
- (H) "Hypertrophied" left ventricular apical area, "quarter sized," may be *slightly* shifted inferiorly or laterally
- (D) "Dilated" left ventricular apical area, marked size increase, shifted laterally
- (E) Ectopic area of left ventricle
- (P) Pulmonic area, 2LICS, parasternal
- (RV) Right ventricular area along lower left sternal border

Primary areas of precordial pulsation: As you progress you will find that additional areas of abnormal pulsation may occasionally be found.

FIG. 7
PRIOR ART

Contour of Precordial Ventricular Impulses

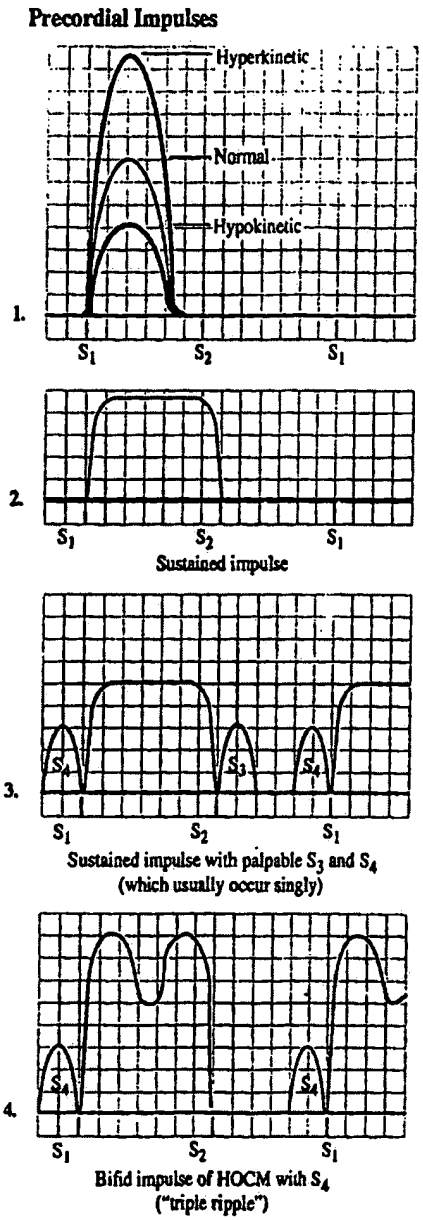
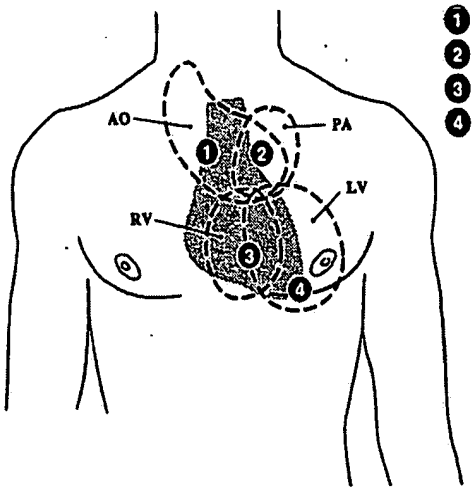


FIG. 8
PRIOR ART

Primary Areas for Cardiac Auscultation



1. Aortic Area (2RSB)
2. Pulmonic Area (2LSB)
3. Tricuspid Area (4LSB)
4. Mitral, (Apical) Area (5LICS, MCL)

As you progress you will find that additional areas are necessary in cardiac auscultation.

Optimum locations for auscultation of the various anatomic regions are shown in numbered circles. Typical extent of the sounds from various areas are shown by dotted lines. This extent will vary with pathology and some sounds and murmurs may "radiate" to other areas such as the left axilla in mitral regurgitation. Sounds from the aorta, pulmonary artery and left atrium may be heard well or even best over the posterior upper thorax as shown.

FIG. 9
PRIOR ART

Perceived Loudness of Heart Sounds and Quiet Speech at Same Sound Level (~50 dB SPL)

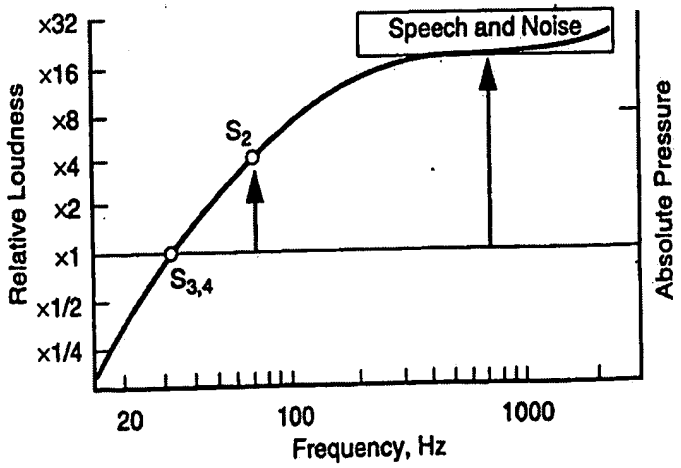
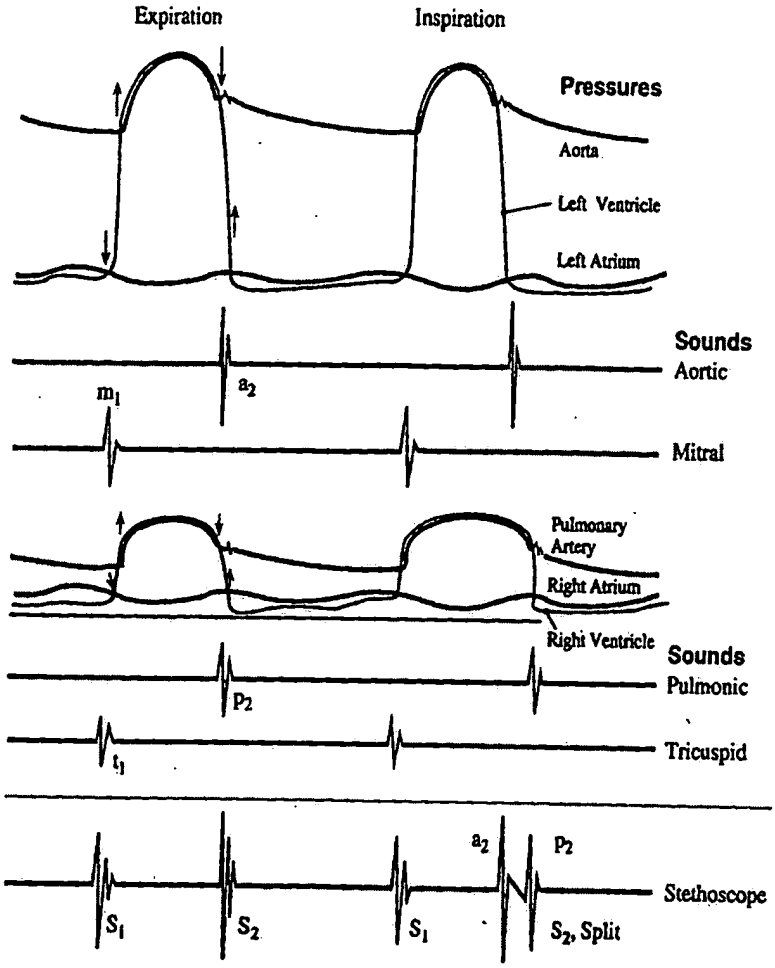


FIG. 10
PRIOR ART

Generation of Normal Heart Sounds, S_1, S_2



Normal valves open silently, indicated by ↑. Closing times, indicated by ↓, of mitral and tricuspid valves are typically so close that their individual sounds, m_1 and t_1, merge to form S_1. On expiration the same is true for aortic and pulmonic valves and their sounds, a_2 and p_2. With increased negative intrathoracic pressure on inspiration the right heart increases its volume and blood is retained in the lungs, reducing left heart volume. Consequently closure of the pulmonic valve is delayed by ejection of the larger volume while aortic valve closure occurs earlier than normal, thus "splitting" the usually merged second heart sounds. Respiratory splitting of the second heart sound occurs in some 30% of normal youth, but its prevalence is reduced by age until it is normally absent by age 60.

FIG. 11
PRIOR ART

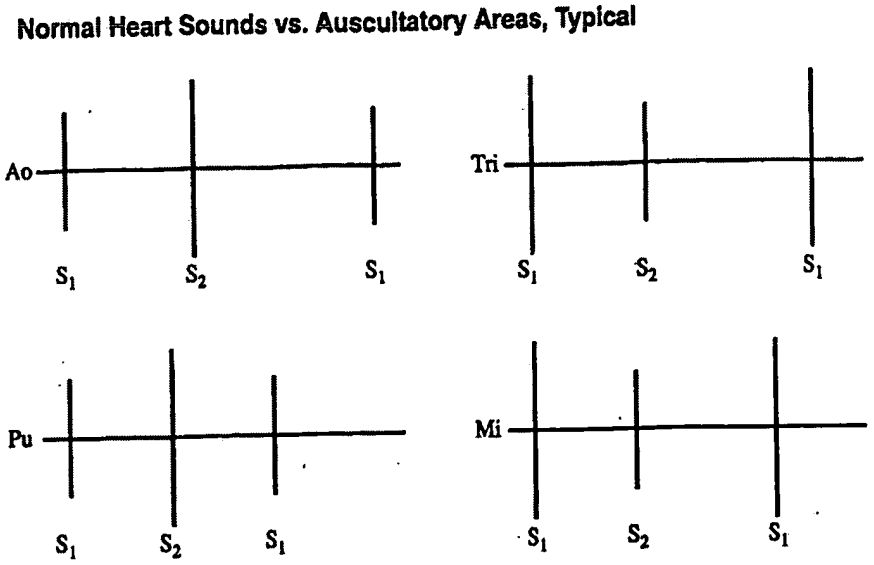
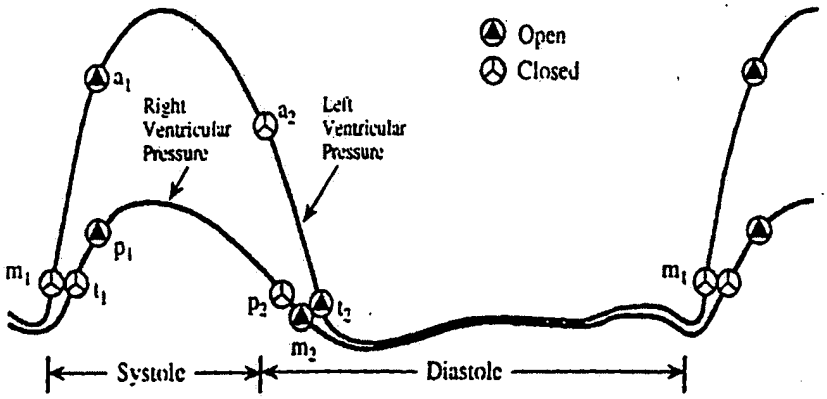
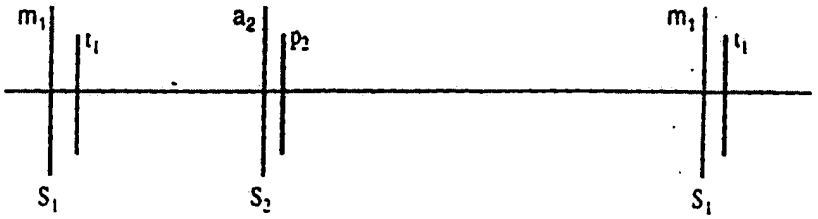


FIG. 12
PRIOR ART

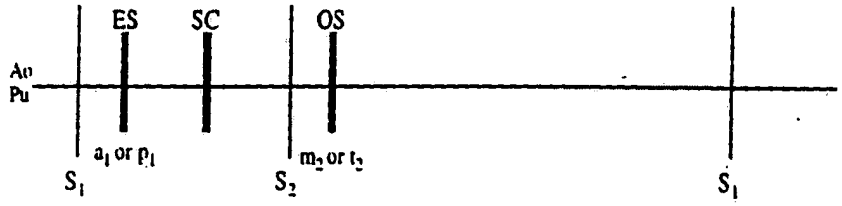
Basic Heart Sounds



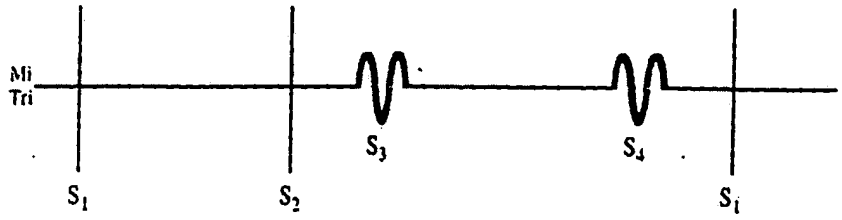
1. $S_{1,2}$ Valve closure and splitting



2. Abnormal Valve Opening



3. $S_{3,4}$ Ventricular Filling



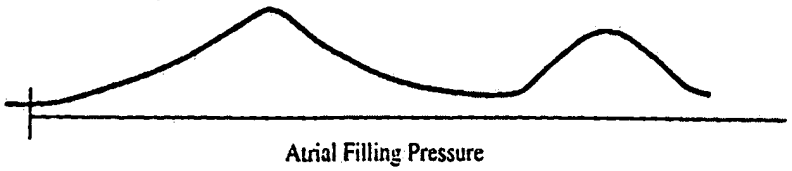


FIG. 13
PRIOR ART

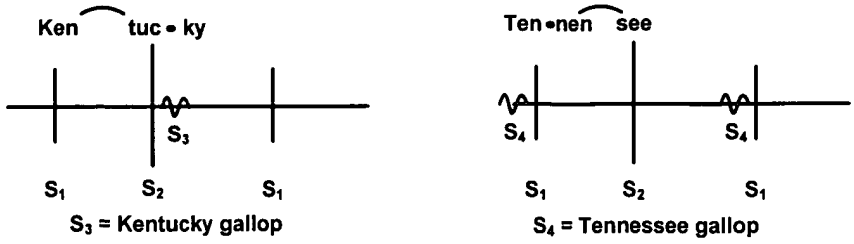


FIG. 14
PRIOR ART

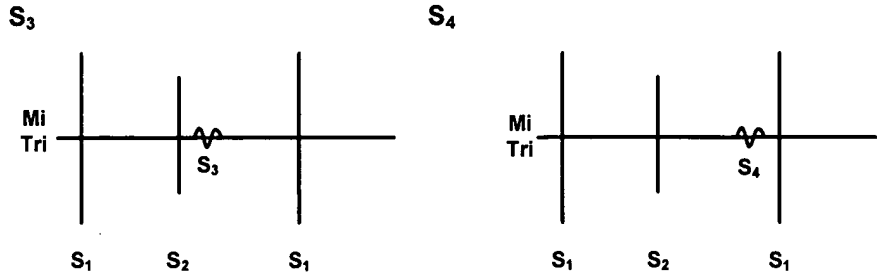


FIG. 15
PRIOR ART

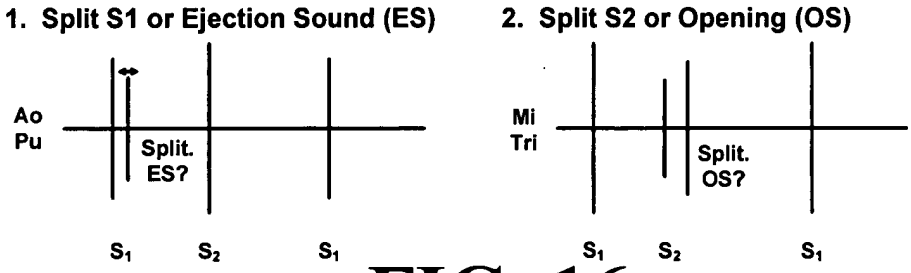


FIG. 16
PRIOR ART

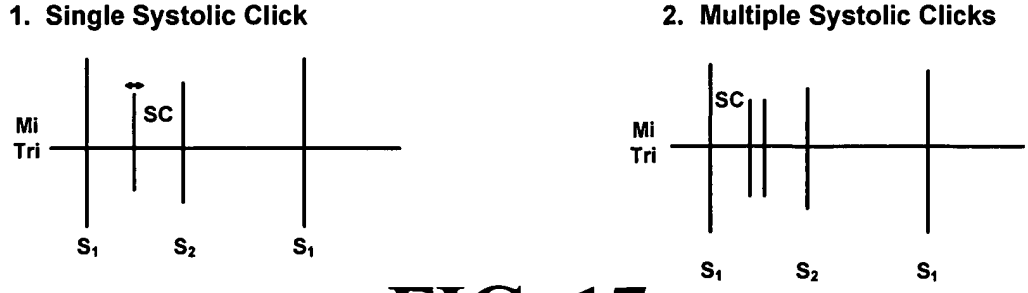


FIG. 17
PRIOR ART

Generation of S_3 and S_4

A Normal filling of ventricles does not cause displacement and diastole is silent.

B Excess velocity of blood early in filling may "shove" the ventricle longitudinally causing oscillation (dotted lines) and an S_3, in some normals. Excess blood flow may cause a *physiologic* S_3.

C A stiff ventricle may be longitudinally displaced by normal filling. This usually produces an S_4 but an S_3 may be present.

D A volume overloaded ventricle may be displaced and usually produces an S_3 but may produce an S_4.

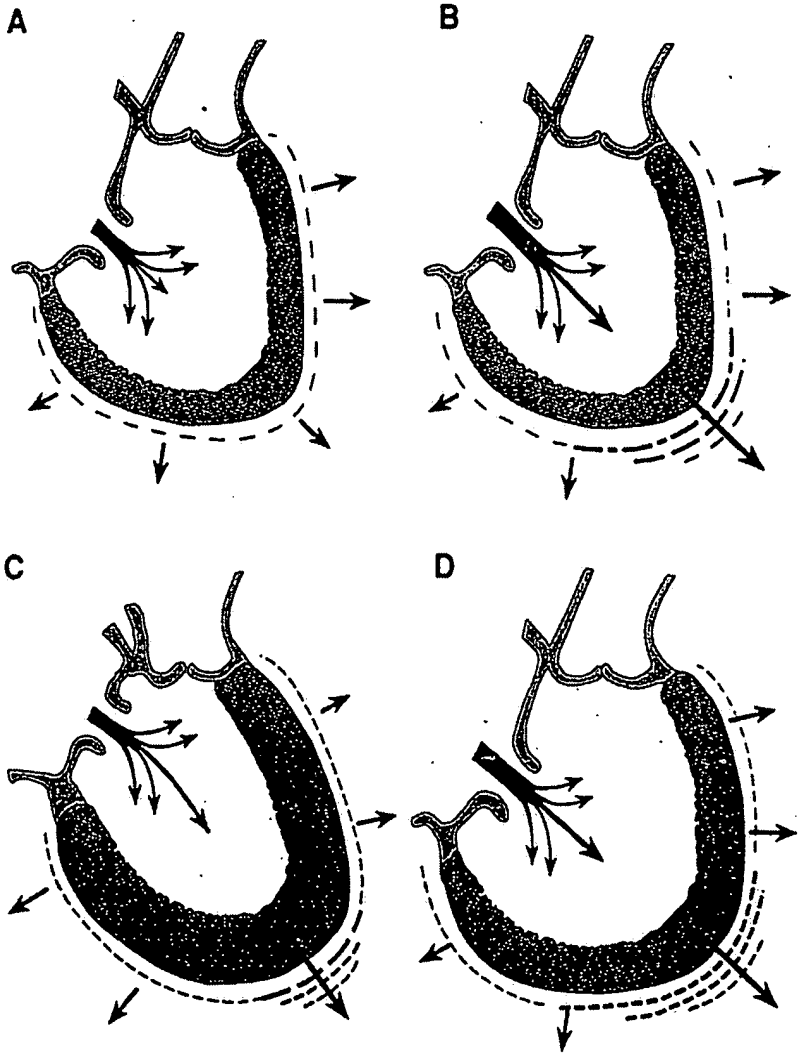


FIG. 18
PRIOR ART

Basic Cardiac Murmurs (Right or Left Ventrical)

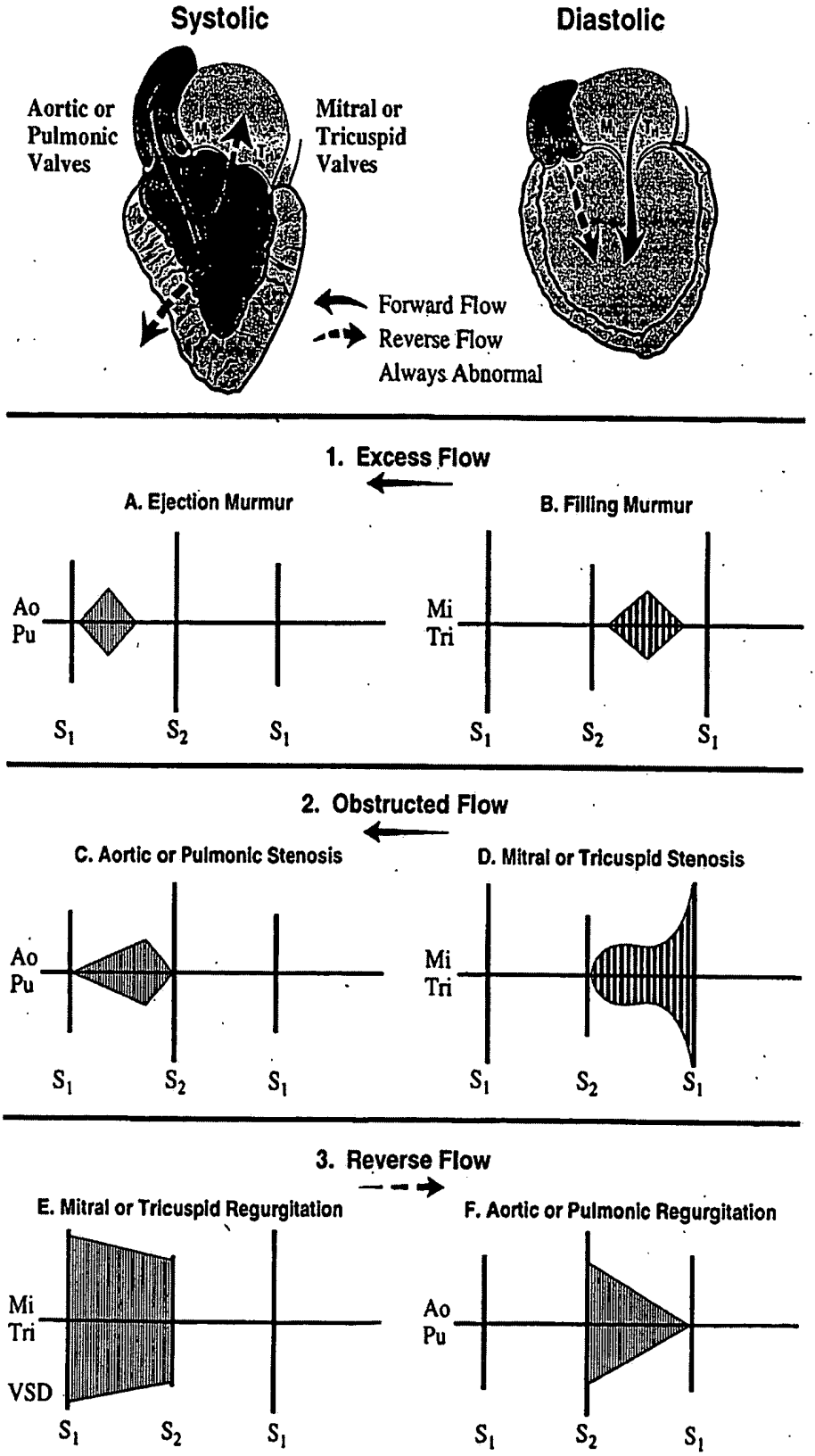
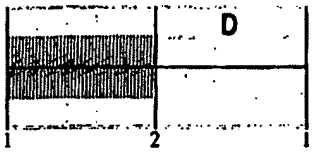
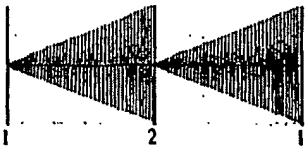
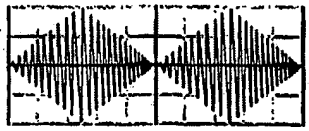
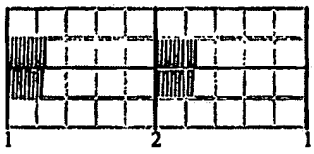
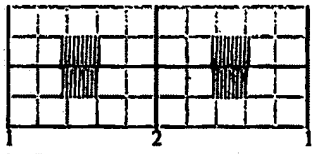
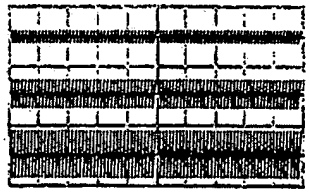
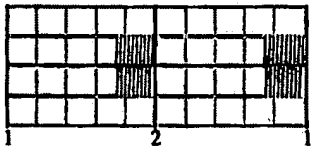
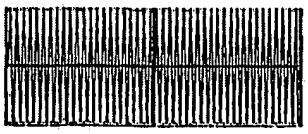
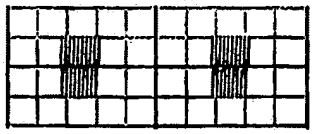
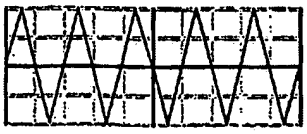
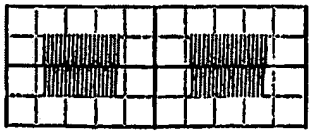
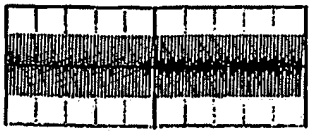


FIG. 19 - Prior Art

Diagrammatic and Descriptive Features of Heart Sounds/Murmurs

Diagram	Description	Diagram	Description
Timing: Interval		**Shape:** (Independent of duration)	
	Systolic		Crescendo (rising)
	Diastolic		Decrescendo
Location in Interval			Crescendo, Decrescendo "Diamond Shaped, triangular"
	Early	**Amplitude: (intensity)**	
	Mid		Grade: 1 – barely audible 2 – audible 3 – moderately loud 4 – loud 5 – very loud 6 – heard without stethoscope, may be palpable
	Late	**Pitch: (frequency)**	
Duration			High
	Short ("brief")		Low
	Long	**Quality:** NA	"Blowing," "soft," "quiet," "cooing," "machinery," "rumble," etc.
	Pan or Holo (entire interval)	**Location, variation with respiration:** NA	Describe where loudest, radiation

Note: "Pre-" and "Post" are closely associated with another event; e.g., pre systolic

FIG. 20
PRIOR ART

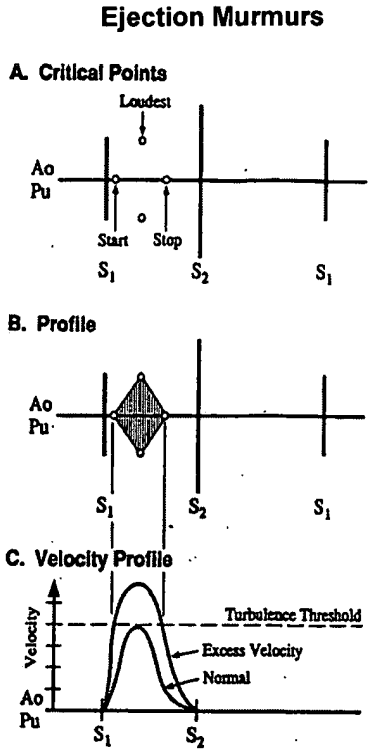


FIG. 21
PRIOR ART

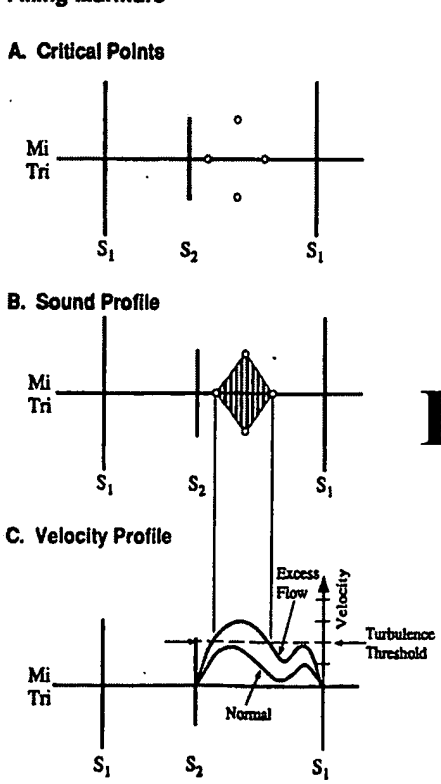


FIG. 22
PRIOR ART

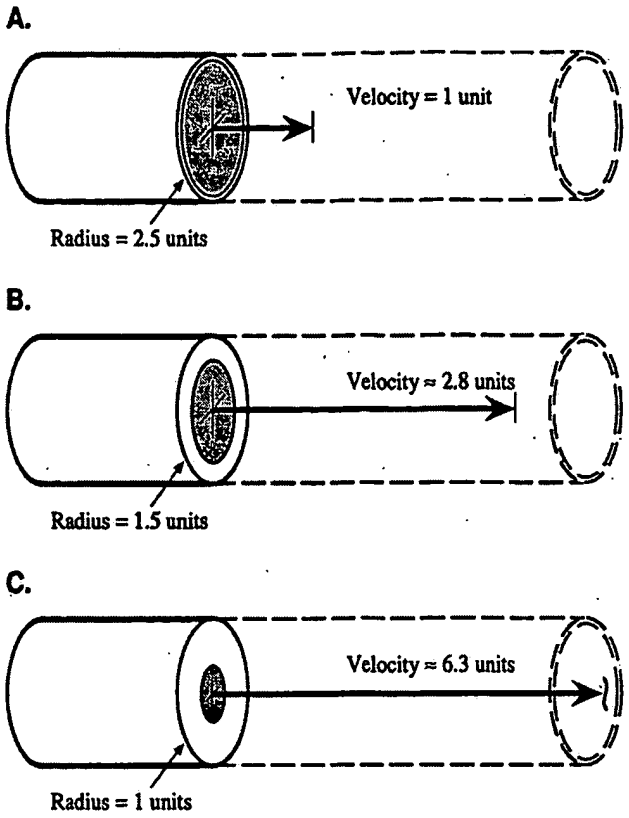


FIG. 23
PRIOR ART

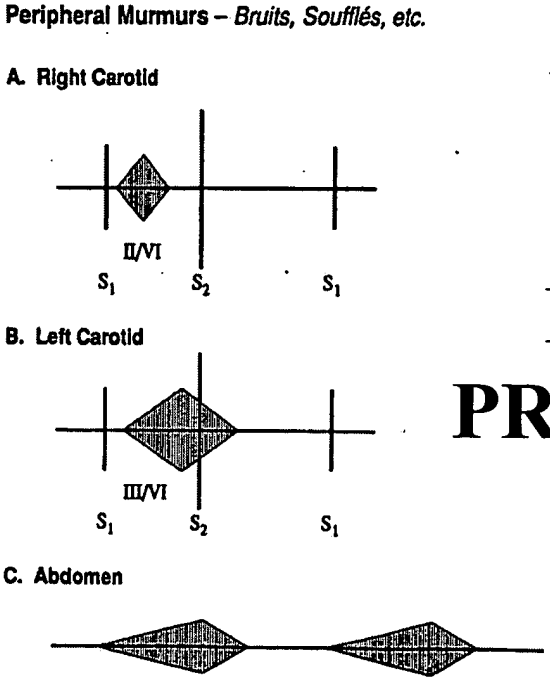


FIG. 24
PRIOR ART

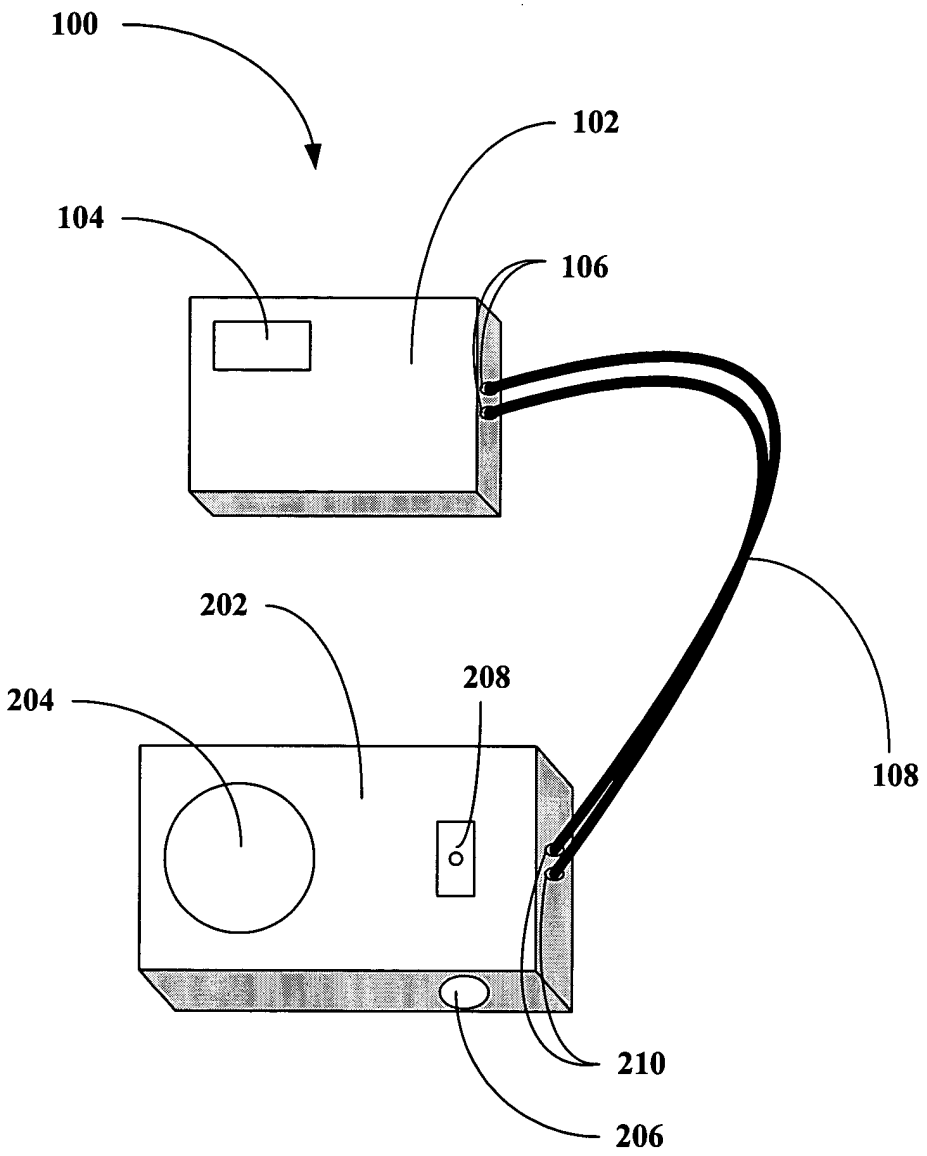


FIG. 25

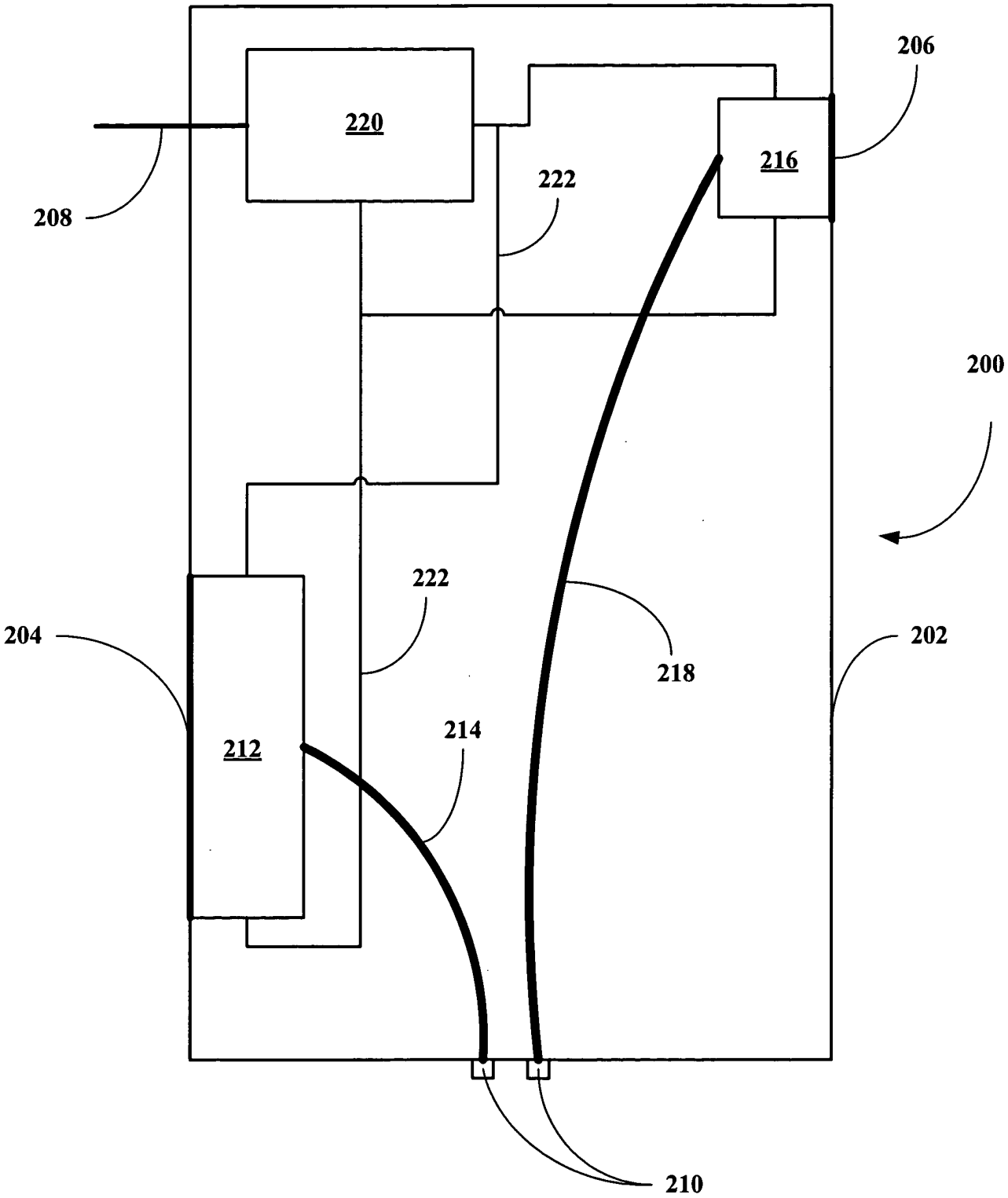


FIG. 26

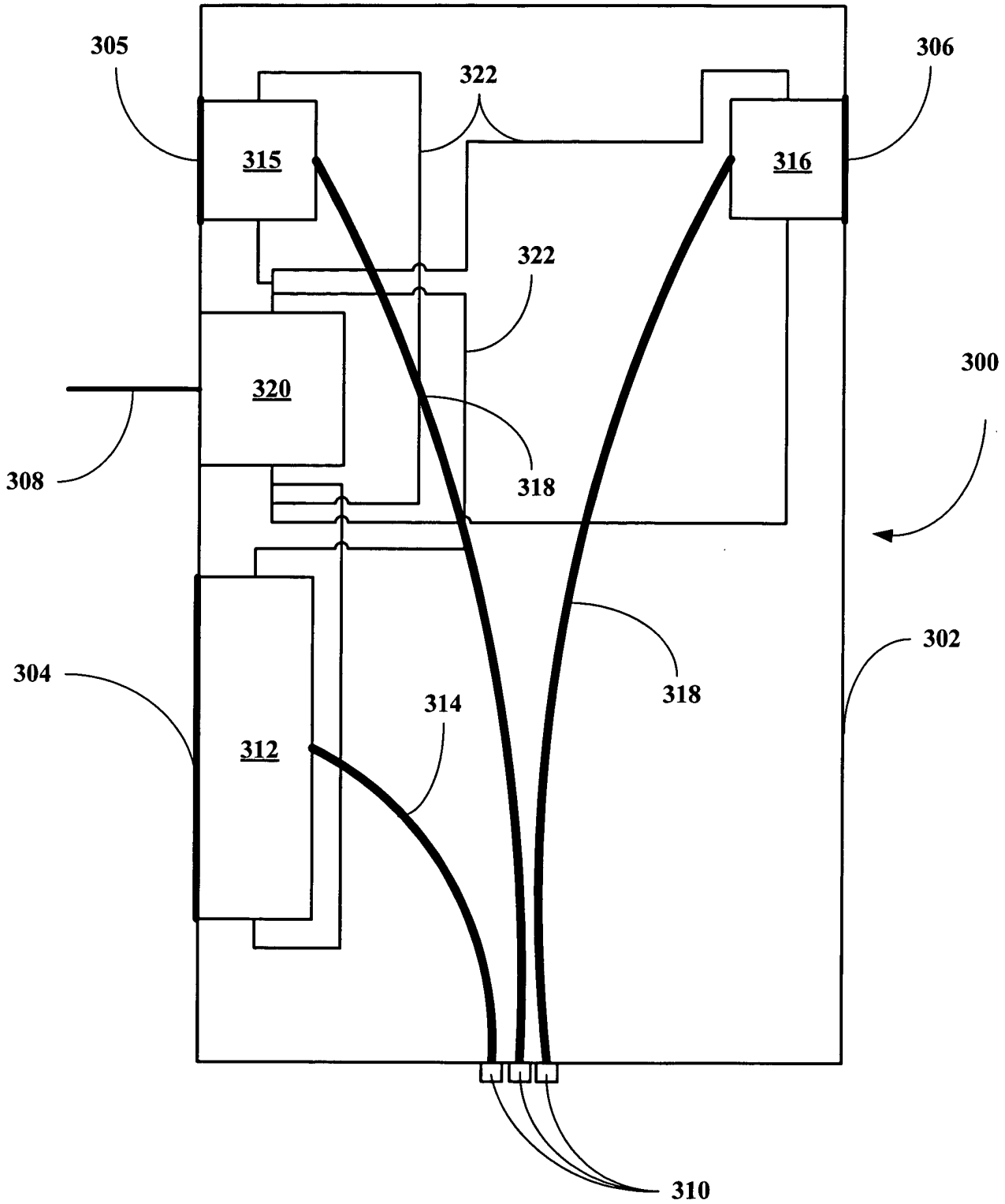


FIG. 27

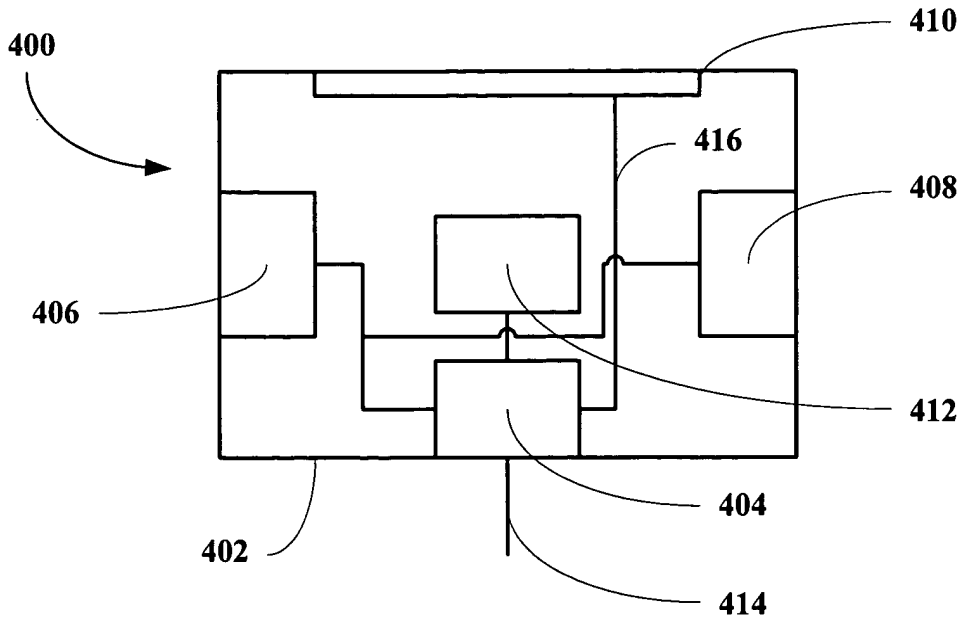

400
410
416
408
406
412
404
402
414

FIG. 28

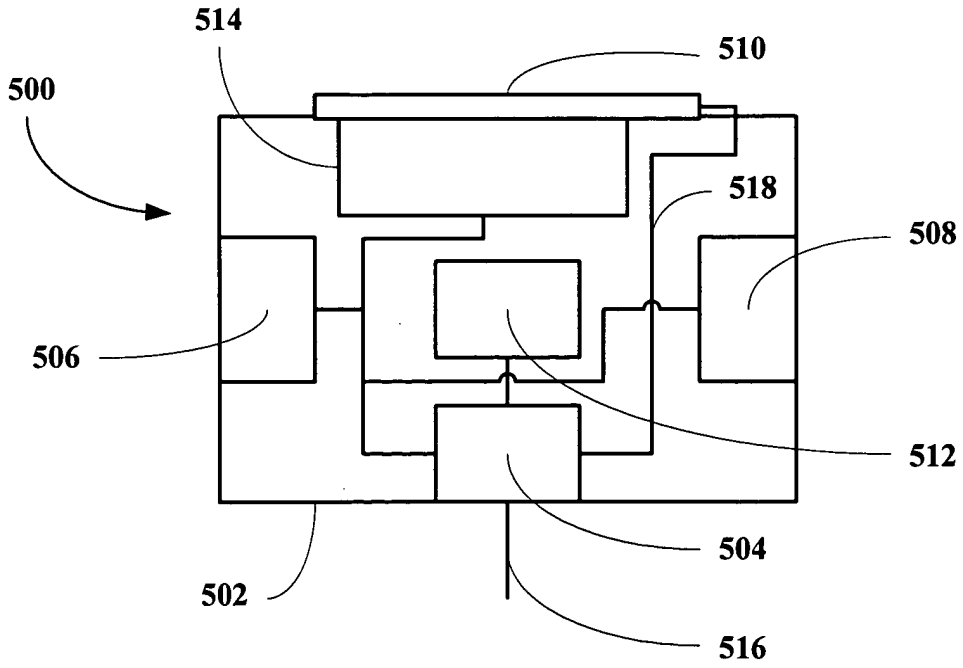

514
510
500
518
508
506
512
504
502
516

FIG. 29

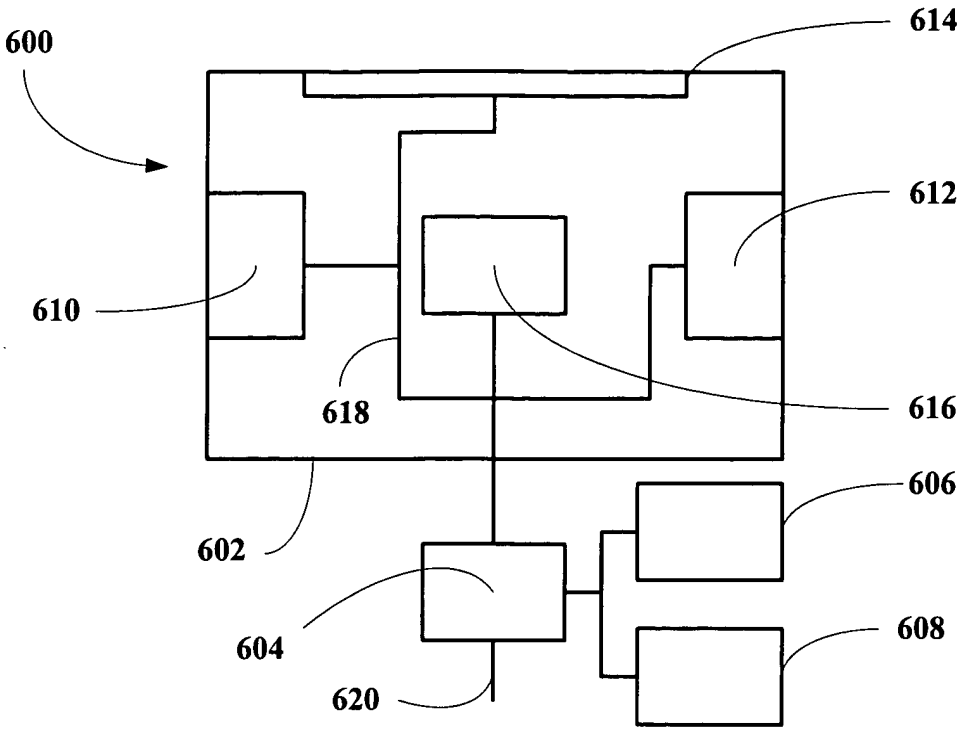

600
614
612
610
618
616
606
602
604
608
620

FIG. 30

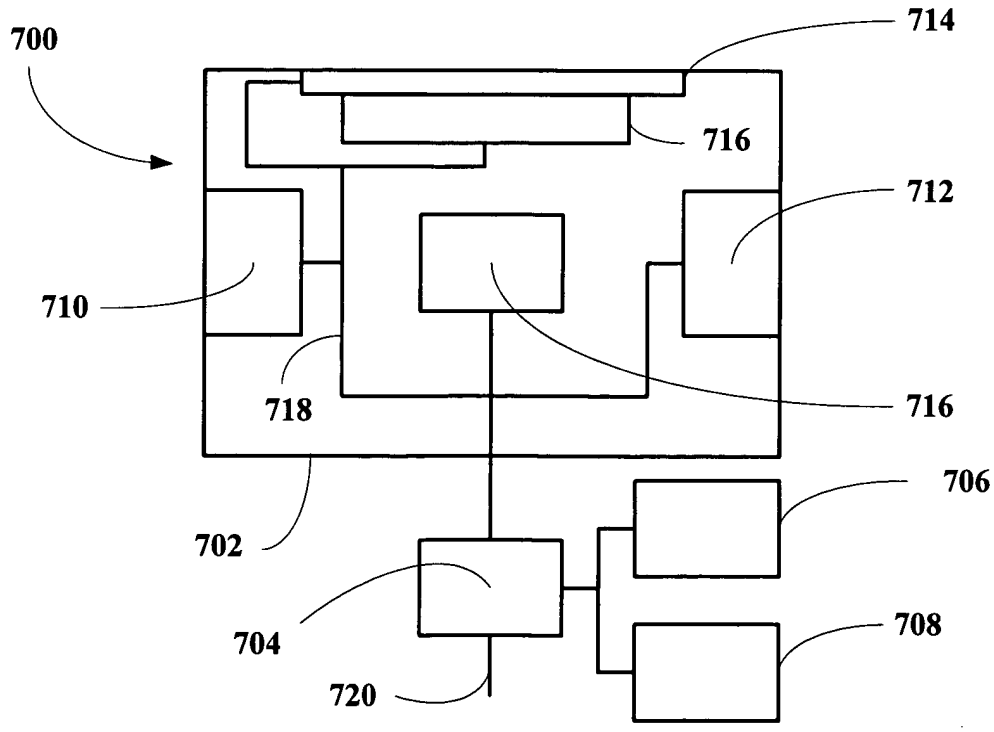

700
714
716
712
710
718
716
706
702
704
708
720

FIG. 31